DOCUMENT RESUME

ED 351 609 CE 062 526

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TITLE A Comparison of Technology Teacher Education Programs in the U.S.A. and Taiwan.
PUB DATE Dec 92
NOTE 13p.; Paper presented at the Annual Meeting of the American Vocational Association (St. Louis, MO, December 4-8, 1992).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Comparative Education; Foreign Countries; Higher Education; Professional Continuing Education; Secondary Education; *Teacher Certification; *Teacher Qualifications; *Technology Education; *Vocational Education Teachers
IDENTIFIERS *Taiwan

ABSTRACT

A comparative study was conducted to determine the implications of the status and anticipated development of technology teacher programs in the United States for reconstructing technology teacher education programs in Taiwan. Data were gathered through a nationwide survey of the departments of education of the 50 states plus Washington, D.C., and the 111 institutions housing technology teacher education programs in the United States. Concurrent with the survey, documents pertaining to technology teacher certification and preparation in Taiwan were collected from the Ministry of Education and two technology teacher preparation programs. Nine conclusions on the status and anticipated development of technology teacher programs in the United States were drawn: (1) using grade point average to admit students will continue to be widely practiced; (2) the appropriate proportion of general coursework, technical studies, and professional courses remains undetermined; (3) English, mathematics, and natural and social science will continue to dominate the general education area; (4) communication, construction, manufacturing, and transportation and power have been established and will continue to dominate the technical studies area; (5) instructional methods and student teaching will continue to be addressed in the professional studies area; (6) raising admission and graduation standards will continue; (7) 5-year programs will not be widely implemented in the near future; (8) using testing to verify teacher candidates' competencies will continue; and (9) there is great diversity in the requirements for certifying technology teachers. Implications for the status and anticipated development of technology teacher programs in the United States for reconstructing technology teacher education programs in Taiwan include the following: Taiwan technology teacher educators should seek to provide more effective communication and to influence legislation to make current technology teacher certification criteria more professional; teacher certificate renewal requirements should be increased to push technology teachers to participate in inservice education; and the knowledge base for certification examination should be identified. (Contains 12 references.) (KC)

ED351609

A COMPARISON OF TECHNOLOGY TEACHER EDUCATION PROGRAMS IN THE U.S.A. AND TAIWAN

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CE062526

Paper presented at the American Vocational Association Annual Convention, St. Louis, Missouri, December 4-8, 1992

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ABSTRACT

The technology teacher education programs in both the U.S.A. and Taiwan have confronted these two developments: (1) the transition of the traditional industrial arts curriculum to technology education, and (2) calls for restructuring teacher education programs. Due to theses two impacts, in the U.S.A. it has been observed that a quickening pace of changes has occurred in the field of technology teacher education as well as in the certification requirements for technology teachers. However, in Taiwan professionals are still struggling with how to successfully reconstruct technology teacher programs in response to those two challenges.

The purpose of this comparative study was to determine the implications of the status and anticipated development of technology teacher programs in the U.S.A. for reconstructing technology teacher education programs in Taiwan. Specifically, in this study, a comprehensive description of current state certification requirements, and the status and direction of technology teacher education programs in both the U.S.A. and Taiwan were explored first; then, with a contrast of the socio-economic and educational context between these two countries, implications for the U.S.A. and Taiwan were drawn.

To explore the current state certification requirements and the status and direction of technology teacher education programs in the U.S.A., a nationwide census was conducted with a researcher-developed questionnaire in 1991. The 51 departments of education (50 states plus Washington, D.C.) and the 111 institutions housing technology teacher education programs in the U.S.A. comprised the useable respondents. Concurrent with the census, documents pertaining to technology teacher certification and preparation in Taiwan were collected from the Ministry of Education and two technology teacher preparation programs. Summary tables and descriptive statistics such as frequency, percentage, mean, median, standard deviation, mode, range, mean rating and rankings were utilized to report the findings.

Nine conclusions on the status and anticipated development of technology teacher programs in the U.S.A. were made: (1) using GPA to admit students will continue to be widely practiced; (2) the appropriate proportion of general coursework, technical studies, and professional courses remains undetermined; (3) English, mathematics, natural and social science will continue to dominate the general education area; (4) communication, construction, manufacturing, and transportation/power have been established and will continue to dominate the technical studies area; (5) instructional methods and student teaching will continue to be addressed in the professional studies area; (6) raising admission and graduation standards will continue; (7) five-year programs will not be widely implemented in the near future; (8) using testing to verify teacher candidates' competencies will continue; and (9) there is great diversity in the requirements for certifying technology teachers.

Consequently, at least eight implications of the status and anticipated development of technology teacher programs in the U.S.A. for reconstructing technology teacher education programs in Taiwan were determined. These implications are that Taiwan technology teacher educators/administrators should: (1) seek to provide more effective communication and to influence legislation to make current technology teacher certification criteria more professional, (2) establish teacher certificate renewal requirements to push technology teachers to participate in inservice education, (3) identify the knowledge base for a technology teacher certification examination, (4) consider changing the amount of required general and technical curriculum in the technology teacher certification standards, (5) balance arts courses and science courses in the required general curriculum balance, (6) make the required technical curriculum more clustered and systematic, (7) require prospective technology teachers to be involved in directed technical majors or teacher-certificate-endorsement study, and (8) increase supervised, substantial, and full-day field teaching experience for prospective technology teachers.

A COMPARISON OF TECHNOLOGY TEACHER EDUCATION PROGRAMS IN THE U.S.A. AND TAIWAN

In recent years, the technology teacher education programs in Taiwan have been being challenged by the following two developments: (1) the transition of the traditional industrial arts curriculum to technology education, and (2) calls for diversifying pre-service teacher education tracks.

The first development comes from the revising of secondary school curriculum standards which are administered by the Ministry of Education (MOE). In the coming new secondary school curriculum standards, it has been decided regarding industrial arts that: (1) its name to will be changed "living technology," (2) its teaching-time-allocation will be varied from two hours to one hour weekly, and (3) all students, boys and girls, will be required to enroll in this course[1]. That is, from a quantitative viewpoint, the new "living technology" will be reduced in teaching time (from two hours to one hour weekly), and expanded in audience (from boys only to all students). Although the objectives and the content of the new "living technology" are still under consideration, it is obvious that these quantitative changes will cause the current objectives and curriculum content for industrial arts to vary. For instance, the current curriculum content must be simplified to cope with the reduction of teaching time.

The aim of technology teacher education is to prepare competent technology teachers who are capable of instruction satisfying curriculum standards. Thus, the variation which will take place in the new "living technology" must be reflected in technology teacher education. This demand will impact on technology teacher education programs.

The second development in technology teacher education programs in Taiwan--calls for diversifying pre-service teacher education tracks--comes from amending the Teacher Education Statute. Prepared by MOE, the draft of the Teacher Education Statute Amendment reflects the loud calls for teacher education reform. At present, secondary school teachers are prepared in normal universities[2]. Every normal university provides five-year programs for those who have completed 12 years of basic education, passed a competitive entrance examination, and wish to enter secondary school teaching. During their five-year period of study in the program, students enjoy a four-year tuition-waiver and receive living expenses from their universities. One additional year is spent in secondary schools in a teaching internship. After completing their five-year programs, graduates from normal universities must fulfill their four-year teaching obligation or refund the cost of their training (Kuo, 1982; Lee, 1990; Liang, 1983).

In order to give graduates of other universities/colleges an opportunity to become qualified teachers, many people, especially those outside teacher education, increasingly insist that all universities/colleges should be allowed to offer teacher

education programs. Accordingly, the following emphases have put on the draft of the Teacher Education Statute Amendment: (1) diversifying preservice teacher education tracks, (2) enforcing student teaching, (3) constructing teacher certification systems, and (4) providing normal university students with options for the financial aid which lead to teaching obligations. Although, the draft of the Teacher Education Statute Amendment is still in need of the approval of the Legislative Yuan, the formative process of the draft indicates that the diversification of preservice teacher education tracks is inevitable.

Technology teacher education is one realm of teacher education. The diversification of preservice teacher education tracks and the coming teacher certification systems will challenge technology teacher education to restructure its programs.

Facing the above two developments, technology teacher education in Taiwan has to reform or reconstruct a new and effective teacher preparation system that can contribute to technology education. Certainly, to make intelligent decisions on both what to reform and how to reconstruct, information search and construction of alternatives is imperative (Driver, 1979).

However, the result of a related literature review indicates that there has been no research study proposing a formula for technology teacher education in Taiwan to cope with the above two developments. This leads to two interrelated problems: (1) although technology teacher education reform in Taiwan is unavoidable, rational information to guide reform is lacking; and (2) due to the lack of rational information, decisions on future reform may be criticized as arbitrary judgments.

Comparison is a problem-solving tool. The main purpose of an international education comparison is to comprehend the existing problems and construct problem-solving alternatives by contrasting and analyzing an/some educational phenomenon(a) in the social, economical, political, and educational context among countries (Carey, 1966; Lin, 1983). Technology education in Taiwan has been greatly influenced by the U.S.A.. In many cases, the advanced experience of technology teacher education in the U.S.A. may serve as a mirror for that in Taiwan.

Related literature (for example, LaPorte, 1990) indicates that technology teacher education in the U.S.A. was confronted by those two developments, which challenge technology teacher education in Taiwan, in 1980s.

Due to theses two developments, in U.S.A. it has been observed that a quickening pace of changes has occurred in the field of technology teacher education as well as in the certification requirements for technology teachers. For instance, Jones's (1988) survey reveals that 93 of 177 (or 63.3 percent) technology teacher education program administrators reported that change recently occurred in their programs. Undoubtedly, the experiences related to these changes can benefit Taiwan as it reconstructs technology teacher education programs.

However, there is lack of comparative studies exploring the status and anticipated development of technology teacher education in the U.S.A. and what implications there may be for Taiwan in the U.S.A. experience. This points out the problem that there has been a significant discrepancy between the understanding and necessary comparison of technology teacher education programs in both the U.S.A. and Taiwan.

Purpose

The purpose of this comparative study was to contrast technology teacher education programs in both the U.S.A. and Taiwan to identify the problems existing in technology teacher education in Taiwan and find help to solve these problems. In order to accomplish this purpose, the following three questions were addressed in this study:

1. What are the current state certification requirements for technology teachers?
2. What is the status and anticipated direction for development of technology teacher education programs in universities/colleges? and
3. What implications for Taiwan can be found in the answers to the above two questions?

Methodology

The methodology employed in this study was comparative study. To answer the first and the third questions expressed above, this study compared the following three components in certification requirements for technology teachers:requirements for completing minimum course credits, requirements for passing certification testing, and content organizers of technical studies. To answer the second and the third questions above, this study contrasted the following six components in college-level technology teacher education programs:admission criteria, curriculum-general education, curriculum-technical studies, curriculum-professional studies, reform efforts, and graduation requirements. When the above components were compared between the U.S.A. and Taiwan, R.O.C., the distinctions of the social, economical, political and educational contexts between these two countries were considered (Carey, 1966).

The U.S.A. data needed in this study was collected from all 51 departments of education (50 states plus Washington, D.C.) and the 111 institutions housing technology teacher education programs (75 percent of the 148 programs listed in the Industrial Teacher Education Directory; Dennis, 1990-91) through letters and researcher-developed questionnaires, respectively (Lee, 1991). Two statistical comparisons--early respondents vs. late respondents and total respondents vs. entire population--on three demographic characteristics indicated that with 95 percent confidence, the characteristics of the 111 institutions could be generalized to the characteristics of the entire population--148

institutions. In addition, the Taiwan data needed in this study was analyzed from related literature and collected from the two technology teacher programs.

Summary tables and descriptive statistics such as frequency, percentage, mean, median, standard deviation, mode, range, mean rating and rankings were utilized. Note that a quarter hour was converted to two-thirds semester hours in this study.

Findings

Certification Requirements for Technology Teachers

1. There were several ladders in the U.S.A. teacher certificates to push teachers to participate in inservice education by means of teacher certificate renewal. In Taiwan, teacher certification is permanent. No renewal requirements are set to stimulate teachers' professional growth. In addition, graduates majoring in industrial design and trade and industrial education are allowed to be endorsed as qualified technology teachers. This indicates that technology teacher educators in Taiwan should make efforts to make technology teaching more professional.

2. In the U.S.A., 16 states had a minimum credit hour requirement for general studies (median 45.5), 28 states required professional studies (median 20), and 26 states required technical studies (median 20). The credit hours required for the general studies and technical studies were exceeded the requirement in Taiwan. This suggests that the appropriateness of the quantitative structure of the three domains of technology teacher education curriculum should be deliberated.

3. Thirty-eight states in the U.S.A. mandated testing prior to certification, and the use of testing to certify technology teachers was found to be increasing rapidly. This indicates that teacher testing systems should be planned as early as possible in Taiwan to cope with the requirement which has been set in the draft of the Teacher Education Statute Amendment.

4. Approximately half of the states in the U.S.A. designated specific technical content organizers for technology teacher candidates. In the coursework, the four content organizers--communication, construction, manufacturing and transportation/power--were widely utilized. However, in Taiwan the content organizers for the technical studies required in technology teacher certification requirements are centered around traditional materials processing. This suggests that these content organizers in Taiwan may be altered to be more clustered and more systematic.

Status and Anticipated Direction for Development of Technology Teacher Education Programs

1. In the U.S.A., prior grade point average (GPA) was most widely used and considered most pivotal as a criterion for

admission to technology teacher education programs, but multiple criteria were employed to screen students. In Taiwan, the entrance examination, emphasizing partial basic skills and employing pencil-and-paper testing, is the only criterion used to screen students. This track is too narrow.

2. In the U.S.A., the number of general education credits required for graduation was 47.73 on average, and English, natural science, social science/studies and mathematics were the four most widely required categories of general education courses. In Taiwan, the general education credits required for graduation is 28, which is much lower than in the U.S.A.. In addition, the courses required in the general education studies were found to be focused on humanities. This indicates that the general education studies required in Taiwan should be more balanced between arts and science content organizers.

3. The technical studies credits required for graduation were 44.97 on average, and communication, construction, manufacturing and transportation (proposed by the CTTE; 1988) were not only widely used to classify but also considered appropriate for organizing technical studies. In addition, approximately one-half of the institutions required additional technical courses, either as technical electives or as a concentration. In Taiwan, the credits required are 50 which is slightly higher than that required in the U.S.A. but the content organizers in these studies are inclined to materials processing. In addition, prospective teachers are not required to take technical electives as a specialization. This suggests that the content organizers for technical studies in Taiwan may be altered to be more clustered and more systematic.

4. The required semester credit hours of professional studies were 29.74 on average, and the two most widely adopted categories of professional studies coursework were instruction and student teaching. The amount of direct, substantial, and full-day student teaching experience required was 12.57 weeks on average. In addition, the four areas of professional knowledge most in need of enhancement were: the planning of stimulating lessons, teaching of problem solving and other aspects of higher order thinking, motivating students to participate in instructional activities, and reflecting upon and improving teaching performance. In Taiwan, the required semester credit hours of professional studies were 28. The duration of field experience for prospective teachers is much longer than that in the U.S.A.; however this experience is lacking in good supervision. This indicates that student teaching supervision should be improved.

5. The two most often implemented teacher education reforms were "raising admission standards" and "raising graduating standards." This suggests that efforts should be made to maintain prospective teachers' quality when teacher education tracks tend to be diversified as in Taiwan.

6. Approximately one-half of the institutions required students to satisfactorily complete the NTE certification test

prior to graduation/certification. Since no teacher certification testing exists other than that which the draft of the Teacher Education Statue Amendment requires in Taiwan, it is urgent to construct an effective testing system.

7. The total number of credits required for graduation was 128.82 on average, and approximately 37 percent of this was general education coursework, 35 percent was technical studies coursework, 23 percent was professional studies coursework, and 5 percent was for optional courses. In Taiwan, the number of credits required for graduation is 148, and 19 percent of this is general education coursework, 34 percent is technical studies coursework, 18 percent is professional studies coursework, and 29 percent is for optional courses. This suggests that the quantitative allocation of the three domains in graduation requirements should be deliberated.

Conclusions and Implications

The conclusions and implications which follow were derived from the findings of the study. Nine conclusions drawn from the status and anticipated development of technology teacher programs in the U.S.A. are listed first. These conclusions can be generalized to all technology teacher education programs in the United States since all the programs were surveyed and the nonresponse error for the study was within five percent.

1. Using prior GPA as a criterion for admission to technology teacher education programs is and will be desirable but is not the whole solution.
2. The required credit hours in general, technical and professional studies appears to have satisfied the state certification requirements, but whether the mean credit hours in each of the areas is proportionate is still unknown.
3. Four basics--English, mathematics, natural science and social science/studies--have dominated and will continue to dominate the general education area.
4. The four content organizers--communication, construction, manufacturing, and transportation/power--have been established and will likely remain in the technical studies area.
5. Subjects related to instructional methods and student teaching experience have frequently been and will be addressed in the professional studies area.
6. The most representative trends toward raising admission and graduation standards in technology teacher education programs will continue.
7. The call for reform that requires instituting a five-year technology teacher education will not be widely implemented in the near future.
8. The quickly growing interest in the use of examinations to verify technology teacher candidates' competencies will continue and related issues will be raised.
9. The chaotic and enormously varied certification requirements for technology teachers indicates that there still

are no common guidelines for preparing technology teachers.

Consequently, at least eight findings of the status and anticipated development of technology teacher programs in the U.S.A. have implications for the reconstruction of technology teacher education programs in Taiwan. These implications are that Taiwan technology teacher educators/administrators should:

1. seek to provide more effective communication and influence legislation to make current technology teacher certification criteria more professional;
2. construct teacher certificate renewal requirements to push technology teachers to participate in inservice education;
3. identify the knowledge base for a technology teacher certification examination;
4. consider changing the amount of the required general and technical curriculum in the technology teacher certification standards;
5. balance the arts courses and the science courses in the required general curriculum;
6. make the required technical curriculum more clustered and systematic;
7. require prospective technology teachers to be involved in directed technical majors or teacher-certificate-endorsement studies; and
8. increase the amount of supervised, substantial, and full-day field teaching experience for prospective technology teachers.

Recommendations

Based on the conclusions discussed above, the recommendations for technology educators and for further research in Taiwan are presented as follows:

Recommendations for Action by Technology Teacher Educators

1. It is recommended that technology teacher educators consider the implications found in this study to reconceptualize their programs.
2. Technology teacher educators should seek to provide more effective communication to search for a consensus regarding technology teacher certification and program accreditation criteria.
3. It is recommended that the experience of the U.S.A. be deliberated on as a mirror around which a thoughtful program innovation is promoted.
4. Technology teacher educators must devote themselves to helping establish a sound environment for technology teaching.

Recommendations for Further Research

1. Technology teacher education is always in a state of transition; hence, it is frequently necessary to conduct a study

similar to this study to update professionals' knowledge of certification requirements and program requirements in other countries.

2. The characteristics of effective technology teacher education programs should be identified.

Summary

This paper has reported on the context, purpose, process and results of a comparative study of technology teacher education programs in the U.S.A. and Taiwan. Current technology teacher certification requirements, and the status and direction of technology teacher education programs in both countries were contrasted and implications for Taiwan were drawn. There remain critical issues for common guidelines and effective program characteristics for preparing technology teachers which should be established and verified as soon as possible.

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Footnotes

[1]According to current junior high and senior high curriculum standards, students in grades 7 to 11 must select either industrial arts or home economics with a two-hour weekly study. Usually, schools assign boys to industrial arts and girls to home economics.

[2]In Taiwan, preservice education for elementary and secondary teachers is still on separate tracks. There are nine teacher colleges preparing elementary school teachers and three normal universities preparing secondary school teachers. All of them recruit students through the nation-wide, once-a-year, and competitive College Joint Entrance Examination (CJEE).

Acknowledgement

The author is indebted to Dr. E. Keith Blankenbaker, Dr. Frank C. Pratzner, and Dr. William E. Loadman who advised the author to complete a study of the status and anticipated development of technology teacher education programs in the United States in 1991. A part of the results of the study are embodied in this paper.